For the case in hand it is assumed that the fuel consumption will be about 300 kg (660 Ib) per ton converted into producer gas of the following composition: H_2, 12.10; CH_4, 2.60, C_2H_4, 0.40; CO, 21.78; 0_2, 0.02; $C0_2$, 5.68; H_20, 3.82; N_2, 53.60, having a thermal value of 1265 calories per m^3 or 142 B.t.u. per cubic foot (low values), the high values being 1352 calories per m^3 or 152 B.t.u. per cubic foot. The heat capacity of this gas, the air supply required for its combustion and for the products of combustion are shown by the curve (Fig. 184). Table 11 gives the combustion and air-supply data for this gas. One pound of coal produces 70 cu ft of gas, 1 kg, 4 m^3 39 of gas. Its specific weight is 1 kg 125 per m^3 (0.07024 Ib per cubic foot). Its products of combustion, with 40 per cent excess air, weigh 1 kg 32 per cubic meter (0.08241 Ib per cubic foot). At the maximum rate of working, the gas will be burned at the rate of 5 m^3 32 (188 cu ft) per second, requiring 8 m^3 51 (301 cu ft) of air for combustion, and the products of combustion will be 12 m^3 77 (451 cu ft), all volumes at 0° C., 761 mm barometer. As the volumetric corrections for pressure are comparatively small, they will be neglected in the computation, and the temperature corrections alone will be used.

As the capacity of the furnace is to be 100 tonnes, the metal volume will be 523 cu ft, and the hearth area has been fixed at 650 sq ft. The approximate depth of the bath will be:

$$\text{depth of bath} = \frac{eZ}{a} = \frac{\text{«,}}{650} = \text{^p} = 2.41 \text{ ft} = 29 \text{ in of metal.}$$

As the bottom will slope toward the tap hole and be banked at both ends and sides, the actual metal depth will depend upon the way this is done. There will be at least 12 inches

of bottom. Therefore, the depth to the brick will be about 42 inches from the sills of the charging doors, and the port sill or bridge will be fixed as 6 inches higher, making the total depth that the flame must drop below the port 48 inches, or about 1200 mm.

The brick lines of the hearth will have to be fixed outside of the bath area of 650 sq ft. Therefore, the inside width between walls will be made 5 m 00 (16.40 ft), and the length between port sills 13 m 50 (44.25 ft), giving an area of 67 m^2 50 (726 sq ft). If the length is cut to 13 m 00 (42.65 ft.) the area will be reduced to